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REPORT FOR CONSULTATION ON THE
STEUBENVILLE-WEIRTON-WHEELING
AIR QUALITY CONTROL REGION
(OHIO, WEST VIRGINIA)

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Consumer Protection and Environmental Health Service
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PREFACE

The Secretary, Department of Health, Education, and Welfare, is directed by the Air Quality Act of 1967 to designate "air quality control regions" to provide a basis for the establishment of air quality standards and the implementation of air quality control programs. In addition to listing the major factors to be considered in the development of region boundaries, the Act stipulates that the designation of a region shall be preceded by a consultation with appropriate State and local authorities.

The National Air Pollution Control Administration, DHEW, has conducted a study of the Steubenville-Weirton-Wheeling area, the results of which are presented in this report. The Region* boundaries proposed in this report reflect consideration of all available and pertinent data; however, the boundaries remain subject to revisions suggested during consultation with State and local authorities. Formal designation of a Region will follow the consultation meeting. This report is intended to serve as background material for the consultation.

The Administration appreciates assistance received either directly during the course of this study or indirectly during previous activities in the Upper Ohio River area from official air pollution control agencies at the State and local level, the Jefferson County Regional Planning Commission, the Brooke-Hancock-Jefferson Metropolitan Planning Commission and the Belmont, Ohio and Marshall Counties Metropolitan Planning Committee.

*For the purposes of this report, the word "region", when capitalized, will refer to the proposed Steubenville-Weirton-Wheeling Air Quality Control Region. When not capitalized it will refer to air quality control regions in general.

INTRODUCTION

"For the purpose of establishing ambient air quality standards pursuant to section 108, and for administrative and other purposes, the Secretary, after consultation with appropriate State and local authorities shall, to the extent feasible, within 18 months after the date of enactment of the Air Quality Act of 1967 designate air quality control regions based on jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards. The Secretary may from time to time thereafter, as he determines necessary to protect the public health and welfare and after consultation with appropriate State and local authorities, revise the designation of such regions and designate additional air quality control regions. The Secretary shall immediately notify the Governor or Governors of the affected State or States of such designation."

Section 107(a) (2), Air Quality Act of 1967

THE AIR QUALITY ACT

Air pollution in most of the Nation's urban areas is a regional problem. This regional problem demands a regional solution, consisting of coordinated planning, data gathering, standard setting, and enforcement. Yet, with few exceptions, such coordinated efforts are notably absent among the Nation's urban complexes.

Beginning with the Section quoted above, in which the Secretary is required to designate air quality control regions, the Air Quality Act presents an approach to air pollution control involving coordinated efforts by Federal, State, and local governments, as shown in Figure 1. After the Secretary has (1) designated regions, (2) published air quality criteria, and (3) published corresponding documents on control technology and associated costs, the Governor(s) of the State(s) must file with the Secretary within 90 days a letter of intent, indicating that the State(s) will adopt within 180 days ambient air quality standards for the pollutants

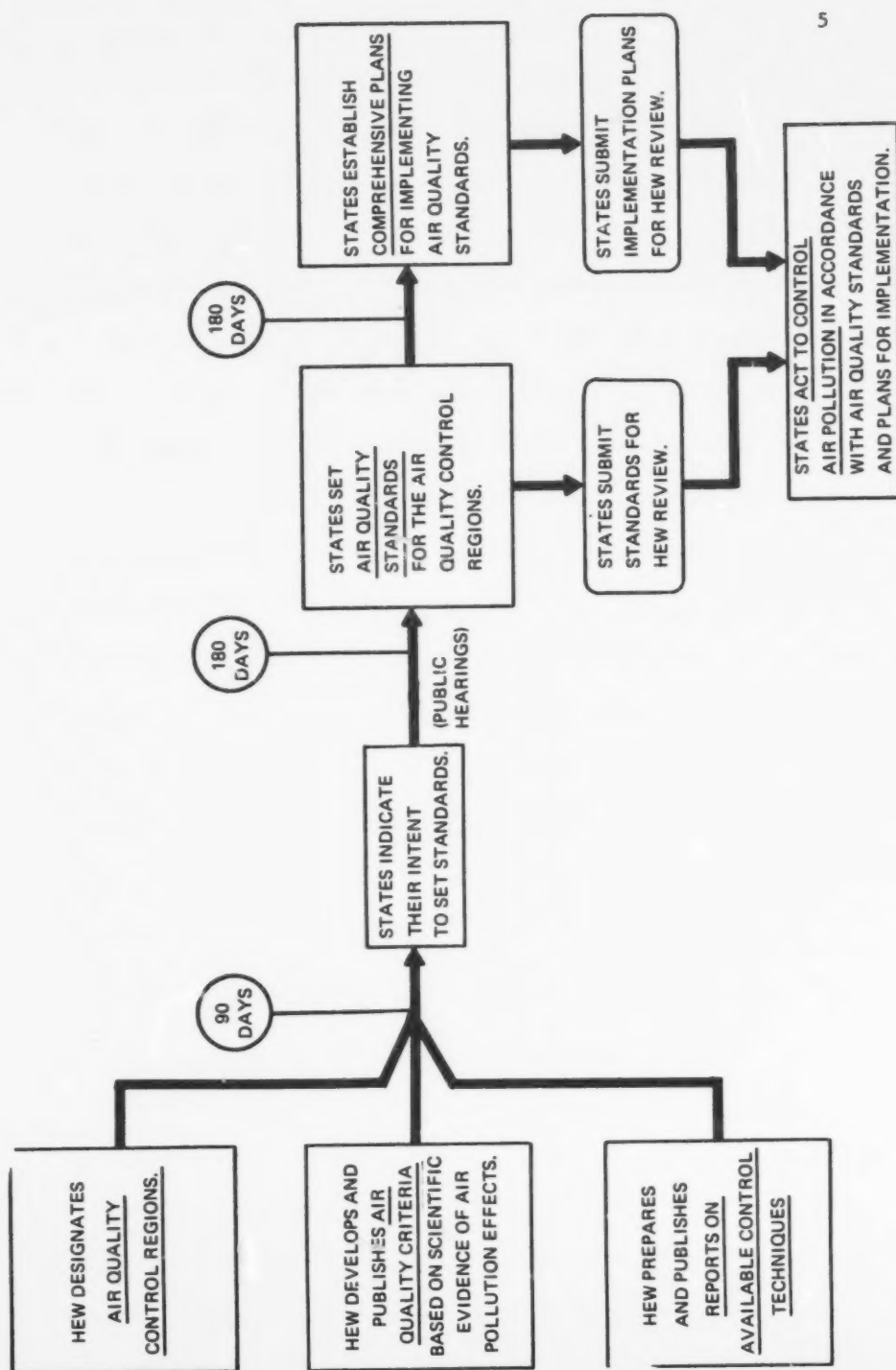


Figure 1 FLOW DIAGRAM FOR ACTION TO CONTROL AIR POLLUTION ON A REGIONAL BASIS, UNDER THE AIR QUALITY ACT.

covered by the published criteria and control technology documents and adopt within an additional 180 days plans for the implementation, maintenance, and enforcement of those standards in the designated air quality control regions.

The new Federal legislation provides for a regional attack on air pollution and, at the same time, allows latitude in the form which regional efforts may take. While the Secretary retains approval authority, the State(s) involved in a designated region assumes the responsibility for developing standards and an implementation plan which includes administrative procedures for abatement and control. For regions which extend across jurisdictional boundaries, informal cooperative arrangements may be adequate in some cases to insure compatible standards and enforcement among the jurisdictions. In other cases, more formal arrangements, such as interstate compacts, may be selected. The objective in each instance will be to provide effective mechanisms for control on a regional basis.

THE SIZE OF A REGION

Several objectives are important in determining how large an air quality control region should be. Basically, these objectives can be divided into three separate categories. First, a region should be self-contained with respect to air pollution sources and receptors. In other words, a region should include most of the important sources in the area as well as most of the people and property affected by those sources. In this way, all the major elements of the regional problem will lie within one unified administrative jurisdiction. Unfortunately, since air pollutants can travel long distances, it is impractical if not impossible to delineate regions which are completely self-contained. The

air over a region will usually have at least trace amounts of pollutants from external sources. During episodic conditions, such contributions from external sources may even reach significant levels. Conversely, air pollution generated within a region and transported out of it can affect external receptors to some degree. It would be impractical and inefficient to make all air quality control regions large enough to encompass these low-level trace effects. The geographic extent of trace effects overestimates the true problem area which should be the focus of air pollution control efforts. Thus, the first objective, that a region be self-contained, becomes a question of relative magnitude and frequency. The dividing line between "important influence" and "trace effect" will be a matter of judgment. The judgment should be based on estimates of the impact a source has upon a region, and the level of pollution to which receptors are subjected. In this respect, annual and seasonal data on pollutant emissions and ambient air concentrations are a better measure of relative influence than short term data on episodic conditions.

The second general objective requires that region boundaries be designed to meet not only present conditions but also future conditions. In other words, the region should include areas where industrial and residential expansion are likely to create air pollution problems in the foreseeable future. This objective requires careful consideration of existing metropolitan development plans, expected population growth, and projected industrial expansion. Such considerations should result in the designation of regions which will contain the sources and receptors of regional air pollution for a number of years to come. Of course, region boundaries need not be permanently fixed, once designated. Boundaries

should be reviewed periodically and altered when changing conditions warrant readjustment.

The third objective is that region boundaries should be compatible with and even foster unified and cooperative governmental administration of the air resource throughout the region. Air pollution is a regional problem which often extends across several municipal, county, and even state boundaries. Clearly, the collaboration of several governmental jurisdictions is prerequisite to the solution of the problem. Therefore, the region should be delineated in a way which encourages regional cooperation among the various governmental bodies involved in air pollution control. In this regard, the existing pattern of governmental cooperation on the whole range of urban problems may become an important consideration. Certainly the pattern of cooperation among existing air pollution control programs is a relevant factor. In general, administrative considerations dictate that governmental jurisdictions should not be divided. Although it would be impractical to preserve State jurisdictions undivided, usually it is possible to preserve the unity of county governments by including or excluding them in their entirety. Occasionally, even this would be impractical due to a county's large size, wide variation in level of development, or striking topographical features.

To the extent that any two of the above three objectives lead to incompatible conclusions concerning region boundaries, the region must represent a reasonable compromise. A region should represent the best way of satisfying the three objectives simultaneously.

PROCEDURE FOR DESIGNATION OF REGIONS

Figure 2 illustrates the procedures used by the National Air Pollution Control Administration for designating air quality control regions.

A preliminary delineation of the region is developed by bringing together two essentially separate studies--the "Evaluation of Engineering Factors," and the "Evaluation of Urban Factors."

The study of "Engineering Factors" indicates the location of pollution sources and the geographic extent of serious pollutant concentrations in the ambient air. Pollution sources are located by taking an inventory of emissions from automobiles, industrial activities, space heating, waste disposal, and other pollution generators. Pollution concentrations in the ambient air are estimated from both air quality sampling data and a theoretical diffusion model. When it exists, air quality sampling data is more reliable than the theoretical diffusion model results since the data is directly recorded by pollution measuring instruments. Unfortunately, in many cases air quality sampling data is available for only one or two pollutants measured at an insufficient number of locations. The theoretical model is used to supplement inadequate air quality sampling data. As a whole, the engineering study indicates how large the air quality control region must be in order to encompass most pollution sources and most people and property affected by those sources.

The study of "Urban Factors" encompasses non-engineering considerations. It reviews existing governmental jurisdictions, current air pollution control programs, present concentrations of population and industry,

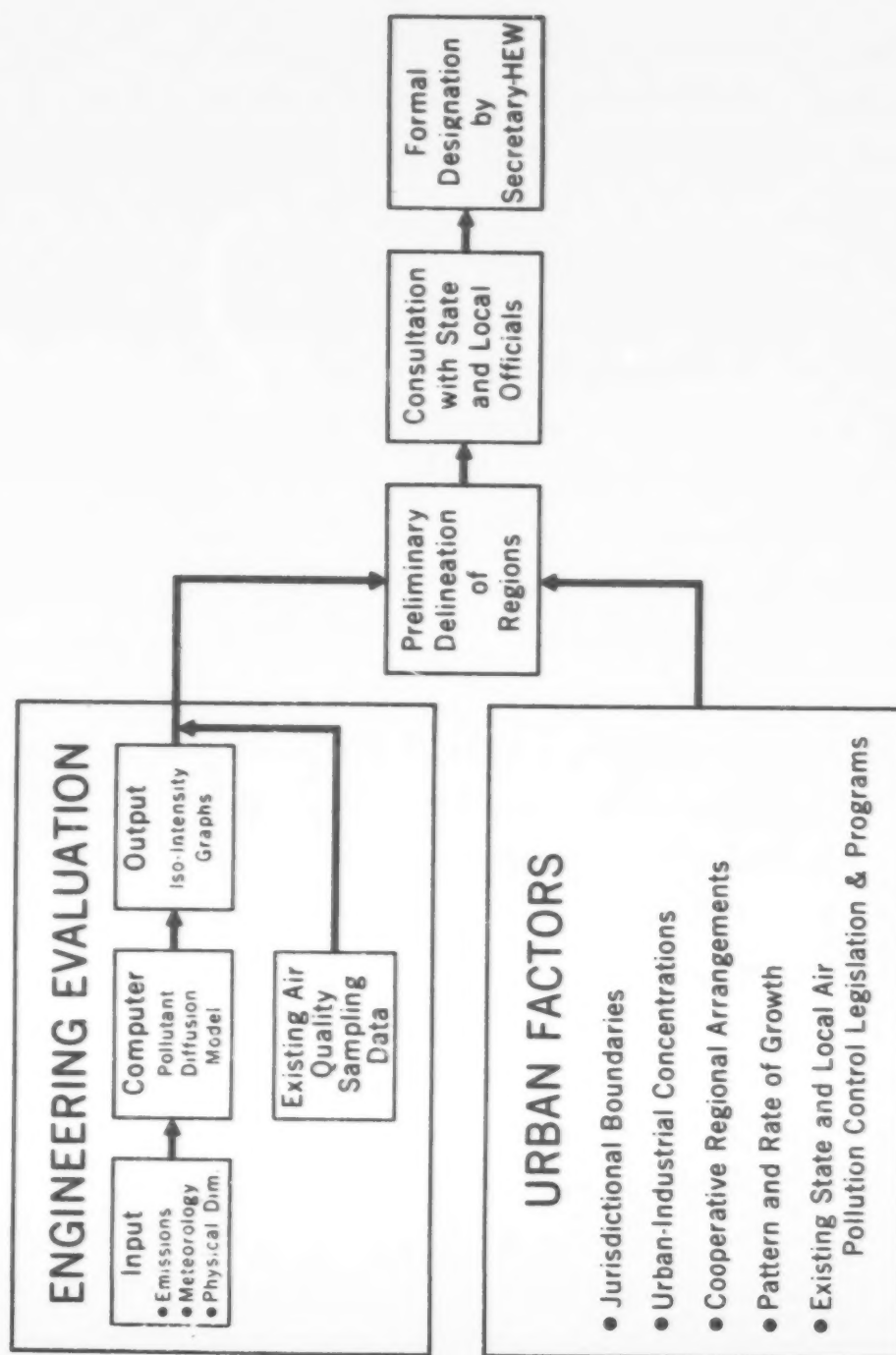


Figure 2. Flow diagram for the designation of air quality control regions.

and expected patterns of urban growth. Other non-engineering factors are discussed when they are relevant. As a whole, the study of urban factors indicates how large an air quality control region must be in order to encompass expected growth of the pollution problem in the future. It also considers which group of governmental jurisdictions will most effectively administer a strong regional air quality control program.

The conclusions of the engineering study are combined with the results of the urban factors study to form the basis of an initial proposal for an air quality control region. As shown in Figure 2, the proposal is then submitted for consultation with State and local officials. After reviewing the suggestions raised during the consultation, the Secretary formally designates the region with a notice in the Federal Register and notifies the governors of the States affected by the designation.

The body of this report contains a proposal for the boundaries of the Steubenville-Weirton-Wheeling Air Quality Control Region and supporting studies on engineering and urban factors. The report itself ~~is~~ was intended to serve as the background document for the formal consultation with appropriate State and local authorities.

EVALUATION OF URBAN FACTORS

INTRODUCTION

A number of urban factors are relevant to the problem of defining air quality control region boundaries. First, the location of population is an important consideration, since human activity is the primary cause of air pollution, and humans are the ultimate victims. The population growth pattern is another important consideration, since an air quality control region should be designed not only for the present but also for the future. The location of industrial activity and the industrial growth pattern are relevant considerations for similar reasons. Political jurisdictional considerations are important, since the Air Quality Act of 1967 envisions regional air pollution programs based on cooperative efforts among many political jurisdictions. The following discussion of urban factors will present these considerations as they apply to the Upper Ohio River area.

Figure 3 shows a map of the Upper Ohio River area. Stark County in Ohio, which contains the city of Canton, has been included in the Cleveland Air Quality Control Region. Mahoning County is likely to be a portion of an air quality control region for the Youngstown-Warren area sometime in the future. Lawrence, Beaver, and Washington Counties in Pennsylvania have been included in the Pittsburgh Air Quality Control Region. Therefore, these five counties are not candidates for inclusion in the Steubenville-Wiarton-Wheeling Air Quality Control Region and will not be considered in the following discussion.

Figure 3;

UPPER OHIO RIVER AREA



Population

Figure 4 displays present population densities for the counties in the Upper Ohio River area. The highest densities occur in five counties clustered along the River; Brooke, Hancock, and Ohio Counties in West Virginia, and Columbiana and Jefferson Counties in Ohio. This pattern of population densities reflects the fact that most of the people in the area are located near the River. Population extends south along the River from these five counties into Belmont and Marshall Counties, which both have more than 100 residents per square mile. Beyond this point the population densities decrease to relatively low levels. Wetzel has about 50 residents per square mile, and Monroe only 33. Thus, most of the population along the Upper Ohio River is contained in a seven county area; Columbiana, Jefferson, and Belmont Counties in Ohio, and Brooke, Hancock, Marshall, and Ohio Counties in West Virginia. These seven counties are surrounded on the north and east by counties which are present or probable future members of other air quality control regions, and on the south and west by counties which have relatively low population densities.

Figure 5 displays expected population growth from 1968 to 1985 in the Upper Ohio River area. The major portion of population growth is expected to occur in the same seven counties which were noted above to contain the bulk of the present population. Again, these seven counties are surrounded on the south and west by counties with low expected growth and on the north and east by counties which are associated with other air quality control regions.

Figure 4. POPULATION DENSITY, 1968

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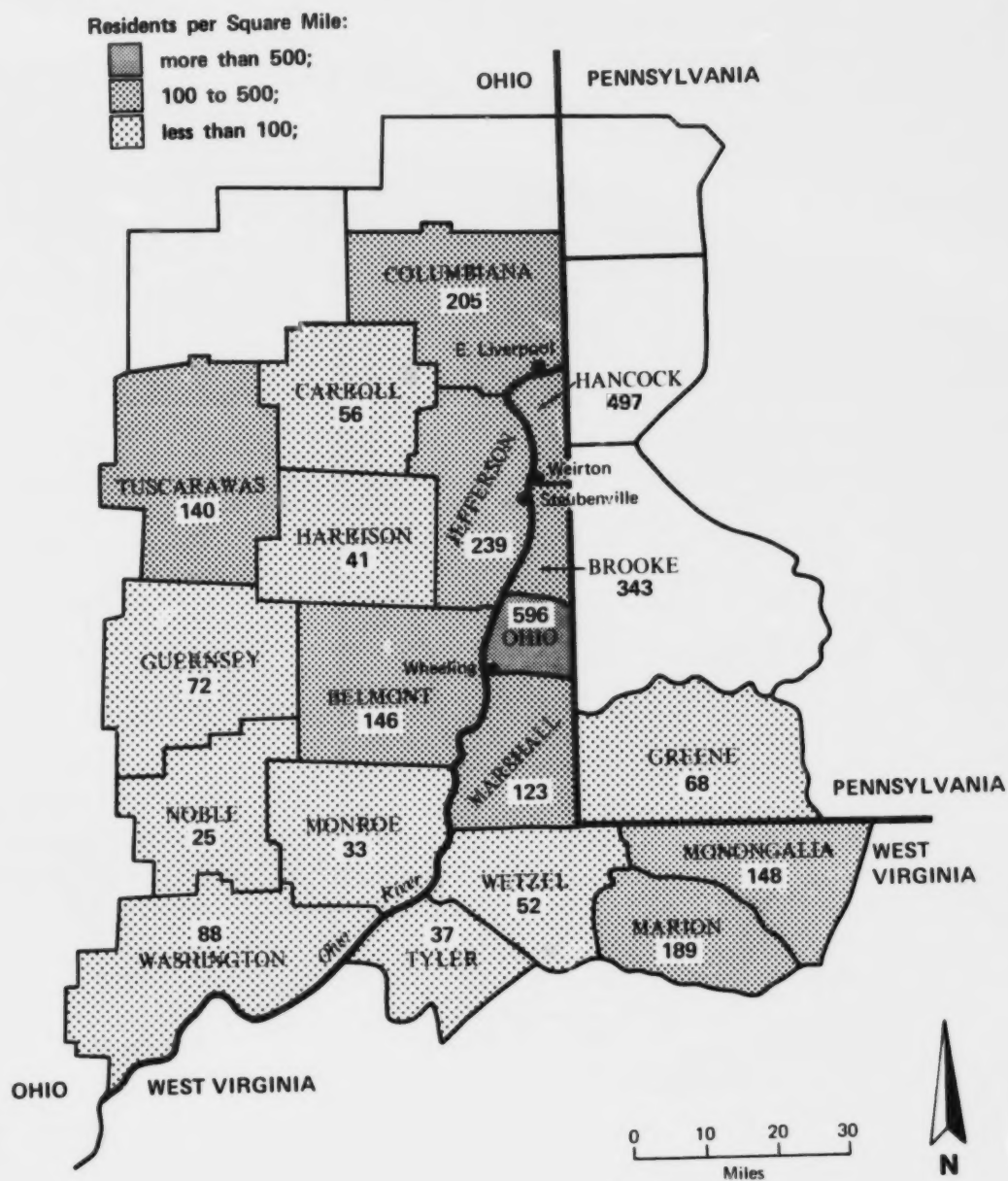
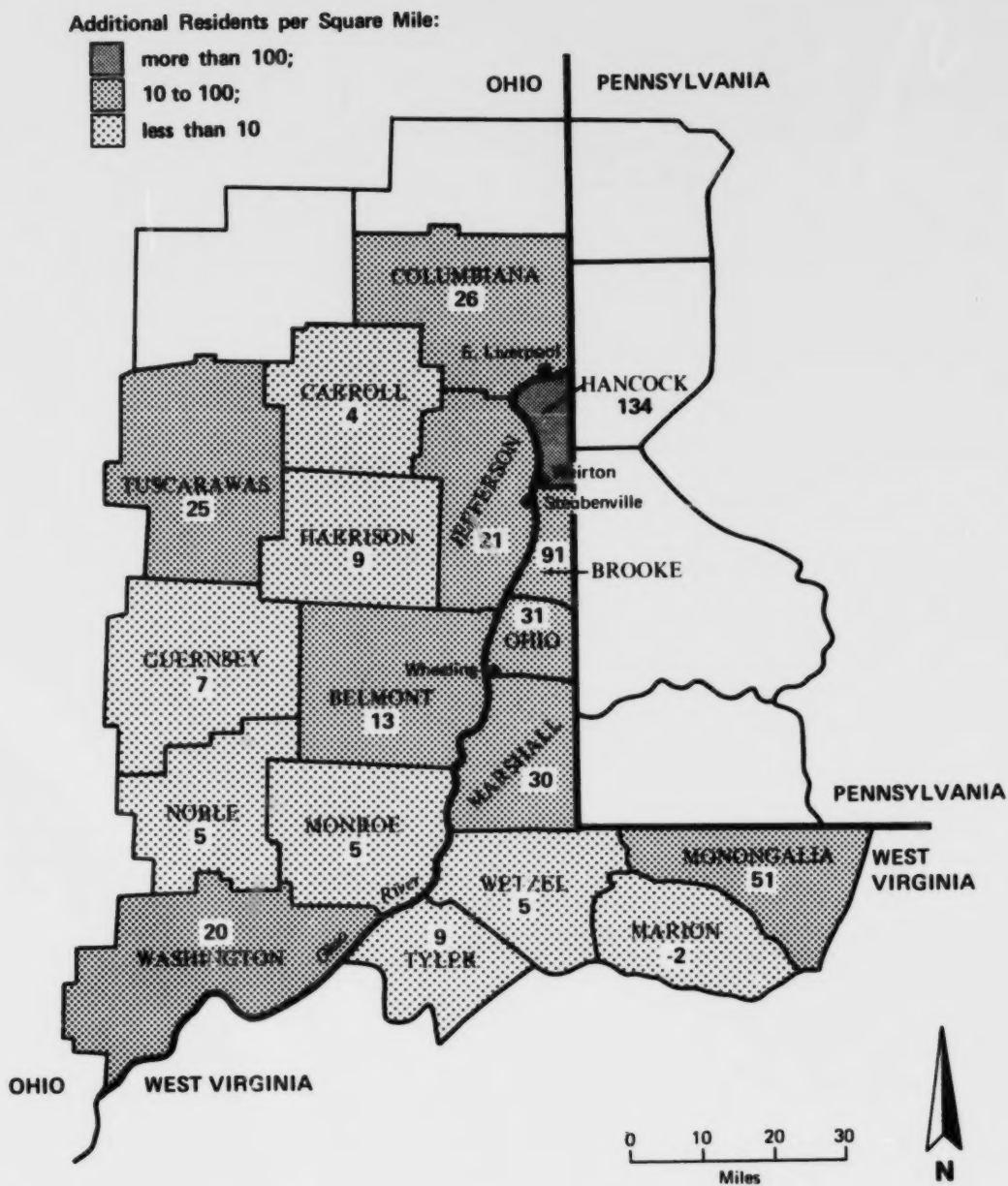


Figure 5. POPULATION GROWTH, 1968 - 1985



Industry

One method for determining the location of manufacturing activity is based on the amount and density of employment in manufacturing firms, as presented in Table 1 and Figure 6. According to this data, which is derived from 1963 Census material, Hancock, Jefferson, and Columbiana Counties have the largest numbers of people employed in manufacturing firms. Ohio, Marshall, Brooke, and Belmont Counties have intermediate numbers of manufacturing employees. When considered in terms of density, manufacturing employment seems most heavily concentrated in Hancock, Ohio, Brooke, and Jefferson Counties. Marshall, Columbiana, and Belmont follow. These figures reflect the fact that a large portion of the manufacturing employment is located along the Ohio River between East Liverpool in Columbiana County and Moundsville in Marshall County. This segment of the Ohio River is encompassed by seven counties, the same seven which contain the bulk of the present population and are likely to experience the most population growth in the near future. However, the seven county area does not contain the complex of chemical industries located in Monroe and Wetzel Counties nor the mining activities located in Harrison and Monroe Counties.

Existing Air Pollution Control Programs

In the State of Ohio, responsibility for air pollution control rests with the Air Pollution Control Board in the State Department of Health. In order to meet its responsibility, the Board is authorized to promulgate ambient air quality standards for various sections of the State, to promulgate and enforce emission standards designed to meet the air quality standards in those sections, and to issue variance

Table I

MANUFACTURING EMPLOYMENT BY COUNTY

COUNTY NAME	NUMBER OF EMPLOYEES IN MANUFACTURING
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WEST VIRGINIA

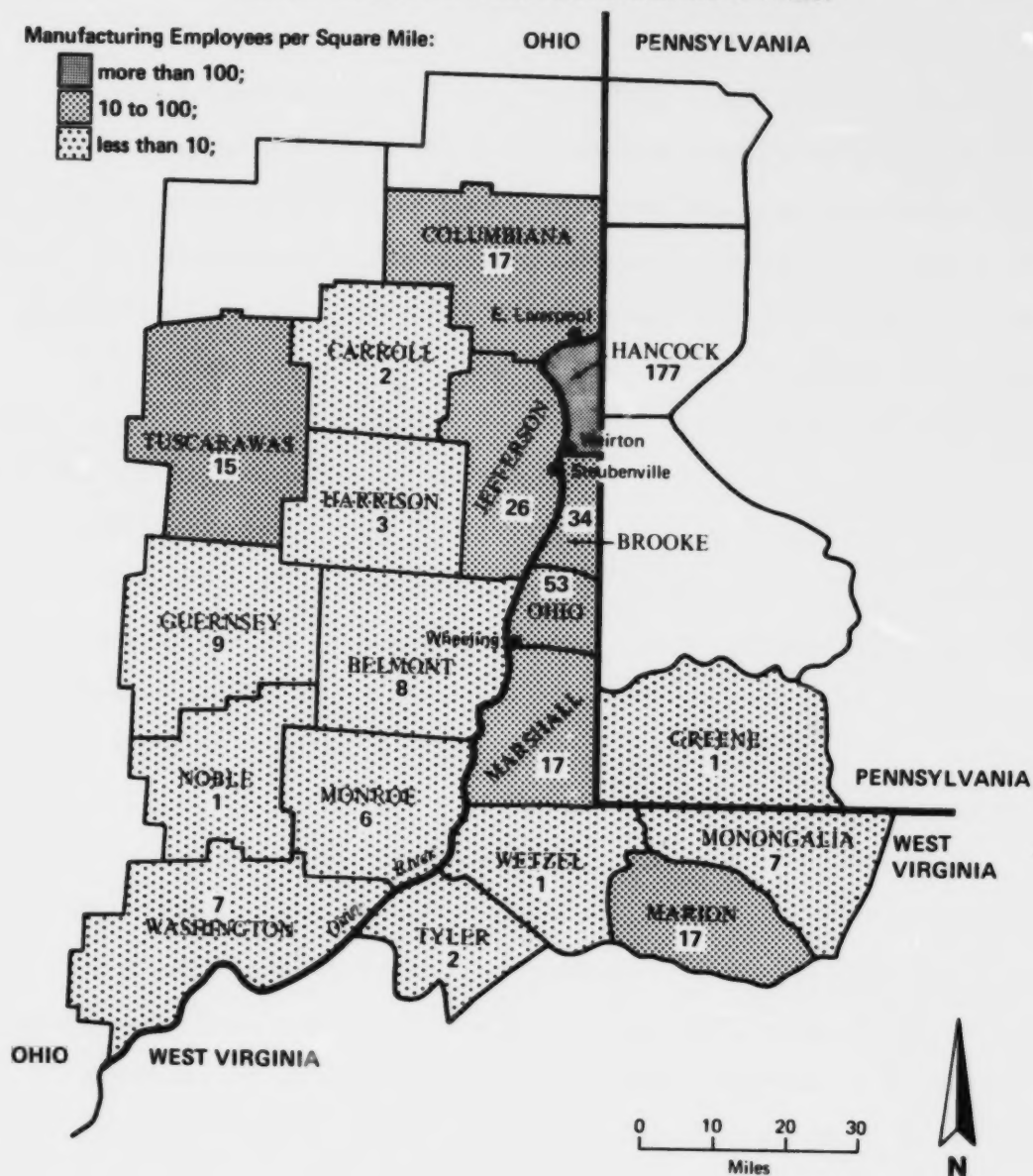
Brooke	3,007
Hancock	14,726
Marion	5,588
Marshall	5,252
Monongalia	2,779
Ohio	5,695
Tyler	598
Wetzel	429

OHIO

Belmont	4,652
Carroll	1,149
Columbiana	9,521
Guernsey	4,772
Harrison	1,319
Jefferson	10,848
Monroe	2,947
Noble	370
Tuscarawas	8,681
Washington	4,762

Bureau of the Census, 1963

Figure 6. DENSITY OF MANUFACTURING EMPLOYMENT



permits for exceptional circumstances. The State program has an annual budget of approximately 250,000 dollars.

Under existing law in Ohio, county governments can develop air pollution control programs only as part of their health program. County regulations concerning air pollution control do not apply within municipal boundaries if a city or incorporated area has its own regulations. Due to this limitation on county jurisdiction, municipal government has become the most usual unit in Ohio for administration of local air pollution control programs.

The City of Steubenville conducts an air pollution control program with an annual budget of about 30,000 dollars. The jurisdiction of the program extends only to the corporate limits of the City, although the program has established contact with industrial point sources and citizen groups outside of the City. Among the duties of the air pollution control Officer is that of enforcing regulations limiting emission of particulates and use of certain coals.

In the State of West Virginia, air pollution control is vested in the Air Pollution Control Commission, which has authority to adopt rules and regulations to meet this responsibility. Coal refuse burning in gob piles, asphalt mix plants, open burning and incineration, coal preparation plants, and objectionable odors are among the air pollution problems covered by statewide regulations adopted by the Commission. The State program has an annual budget of about 285,000 dollars. State legislation does not authorize air pollution control programs operated by county and local governments. However, a specific exemption has been made for the City of Wheeling, which had a program prior to the 1961 legislation which

created the State program.

The air pollution program operated by the City of Wheeling has jurisdiction only within the city limits. The air pollution control Engineer is authorized to enforce regulations which limit the emission of particulates and odors. The Engineer may grant variances and provide for emergency procedures. The program's budget is about 23,000 dollars.

Regional Planning in the Upper Ohio River Area

The Belmont, Ohio and Marshall Metropolitan Planning Commission, established during March 1969, will conduct planning functions for three counties; Belmont, Ohio, and Marshall. It was created as a replacement for the Transportation Study Commission which was formed during 1964.

The Brooke-Hancock-Jefferson Metropolitan Planning Commission was established during October 1968. Funding arrangements are still being developed, but the program is operating on a budget of about 75,000 dollars. The Commission is cooperating with the Jefferson County Regional Planning Commission on a regional land use study, a comprehensive development plan, and a transportation study. In the future, the Commission expects to include air and water pollution control planning and comprehensive health planning among its activities.

The Jefferson County Regional Planning Commission has an annual budget of about 170,000 dollars. This Commission has been cooperating with the Brooke-Hancock-Jefferson Commission on the land use study and the transportation study, while conducting other planning functions for Jefferson County alone.

SUMMARY

The evaluation of urban factors has revealed that most of the population in the Upper Ohio River area is located within seven counties; Columbiana, Jefferson, and Belmont in Ohio, and Hancock, Brooke, Ohio and Marshall in West Virginia. Furthermore, most of the expected population growth is expected to occur in these same seven counties. Except for some strip mining and chemical industries, most of the manufacturing activity in the Upper Ohio area is located within these seven counties. Regional planning functions are conducted in six of the seven counties, but there is no planning commission which has jurisdiction over the region as a whole. Furthermore, comprehensive regional planning across county boundaries is a relatively recent development in the area.

EVALUATION OF ENGINEERING FACTORS

INTRODUCTION

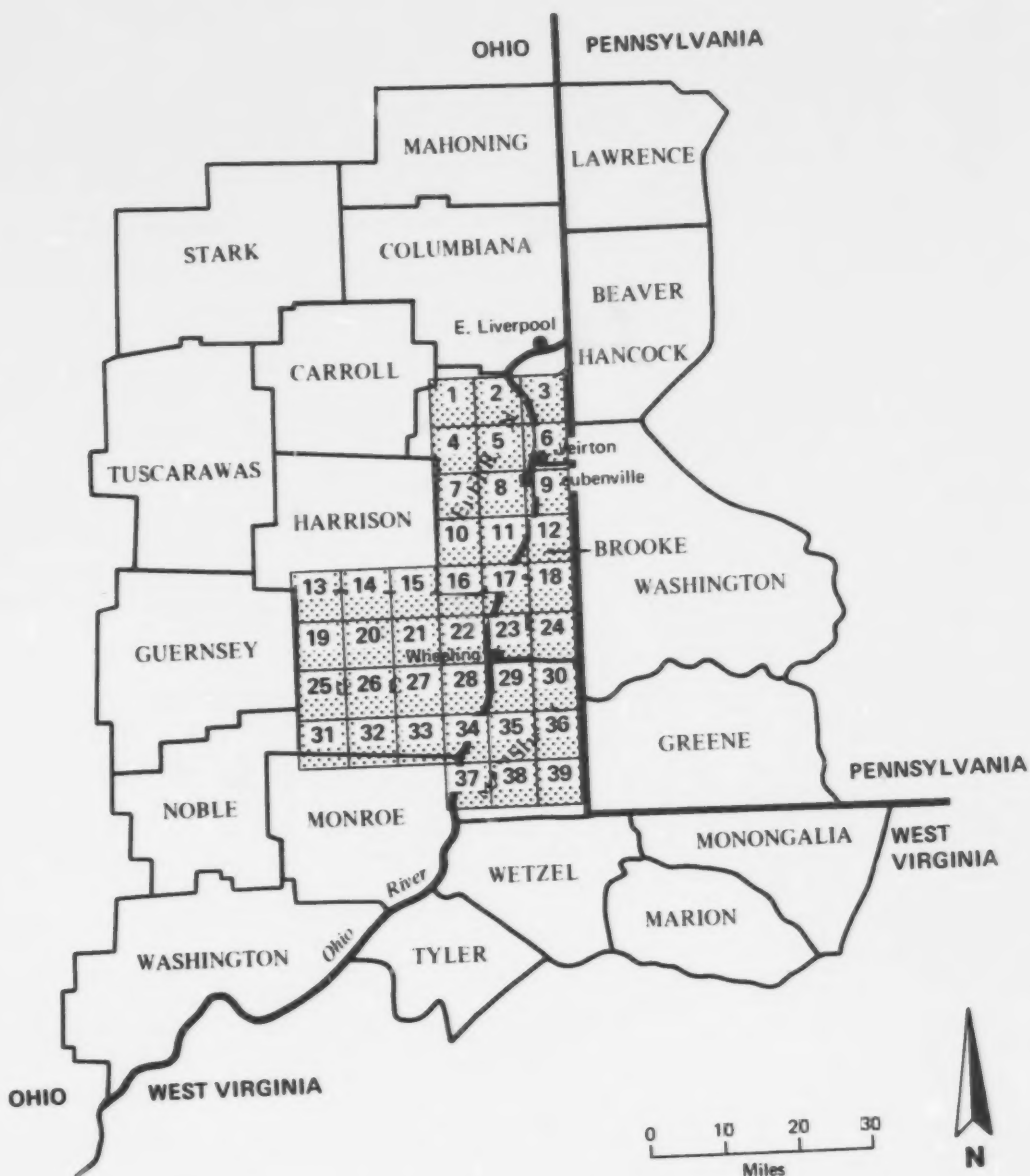
A study of the technical aspects of air pollution in the Upper Ohio River area was based on consideration of pollutant emissions, topography, meteorology, and theoretical and measured air quality.

EMISSIONS INVENTORY

An emissions inventory is a quantitative description of emission sources broken down by geographic location and type of pollutant. The inventory usually identifies the "core" of an air quality control region -- that is, the area where the bulk of the emissions occur and throughout which control activities must take place in order to deal with a regional air pollution problem. For this reason, a presentation of the emissions inventory serves as a logical starting point in the engineering evaluation.

The National Air Pollution Control Administration conducted an inventory of air pollutant emissions for the Upper Ohio River area. Three major pollutants -- sulfur oxides, carbon monoxide, and particulates -- were considered since emissions of these pollutants provide a general measure of the locations and density of air pollution sources in the area. The emissions inventory encompassed most of six counties: Jefferson and Belmont in Ohio, and Hancock, Brooke, Ohio, and Marshall in West Virginia. This area was divided into the grid coordinate system shown in Figure 7. Each grid zone encompasses about 38 square miles. The estimated emissions of each of the three pollutants were

FIGURE 7:
EMISSIONS INVENTORY GRID SYSTEM



expressed by grid zone as average daily emissions on the basis of an annual averaging time. Emission densities for each of the three pollutants, expressed in tons per square kilometer per day, were determined by relating the total emissions in each of the grid zones to the land area of that zone. Table II and Figure 8, 9, and 10 present the resulting densities. Where point sources (sources emitting more than 100 tons per year of any pollutant) are responsible for more than 50% of the emissions in a grid zone, this fact is indicated in both Table II and the figures. Figure 11 shows the relative contribution of the various counties and various source categories to the total emissions of each pollutant.

Particulate Emissions:

Figure 8 shows clearly that the bulk of the particulate emissions in the study area occurs along the Ohio River Valley. As the distance from the River increases, the density of particulate emissions decreases. Thus, the western portions of Jefferson and Belmont Counties do not contribute significant amounts of particulate emissions to the regional problem. Figure 11 indicates that power plants and industrial point sources are responsible for about 96% of the particulate emissions. Among the counties in the study area, Jefferson contributes the most to particulate emissions, with about 48% of the total. Since the emissions inventory did not cover Columbiana County, it did not record particulate emissions from the pottery and clay products industries in the East Liverpool area.

TABLE II. EMISSION DENSITY
Tons Per Square Kilometer Per Day

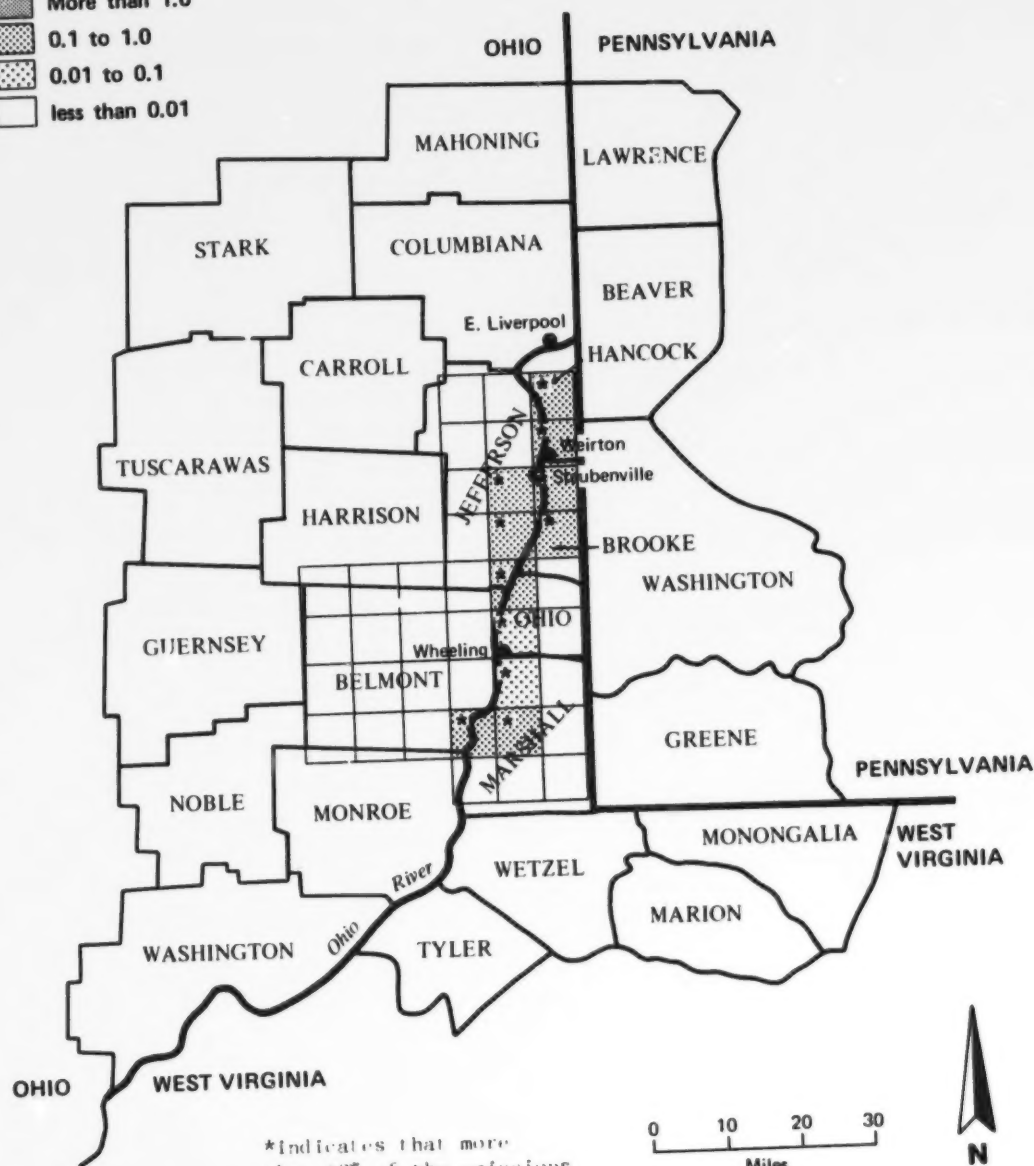
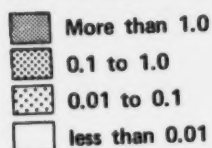
Grid Number	Particulates	Sulfur Oxides	Carbon Monoxide
1	.003	.010	.041
2	.002	.001	.069
3	.455*	3.877*	.161
4	.003	.004	.055
5	.004	.007	.082
6	.784*	.638*	.466
7	.004	.009	.055
8	.136*	.027	.328
9	.608*	.704*	.281
10	.004	.013	.055
11	.651*	4.956*	.082
12	.763*	.829*	.055
13	Neg.	Neg.	.027
14	Neg.	Neg.	.022
15	Neg.	Neg.	.019
16	.002	.003	.082
17	.184*	.179*	.096
18	.004	.008	.082
19	Neg.	Neg.	.055
20	.002	.004	.055
21	.002	.011	.082
22	.004	.007	.137
23	.072*	.104*	.746
24	.001	.003	.127
25	.001	.011	.055
26	.002	.010	.055
27	.001	Neg.	.027
28	.001	.003	.110
29	.025*	.050	.137
30	.003	.005	.055
31	Neg.	Neg.	.022
32	Neg.	Neg.	.025
33	Neg.	Neg.	.027
34	.242*	3.395*	.036
35	.260*	2.557*	.041
36	.003	.005	.014
37	.004	.006	.027
38	.003	.005	.014
39	.002	.003	.012

*indicates that more than 50% of the emissions in the grid are due to point sources.

FIGURE 8
PARTICULATE EMISSIONS

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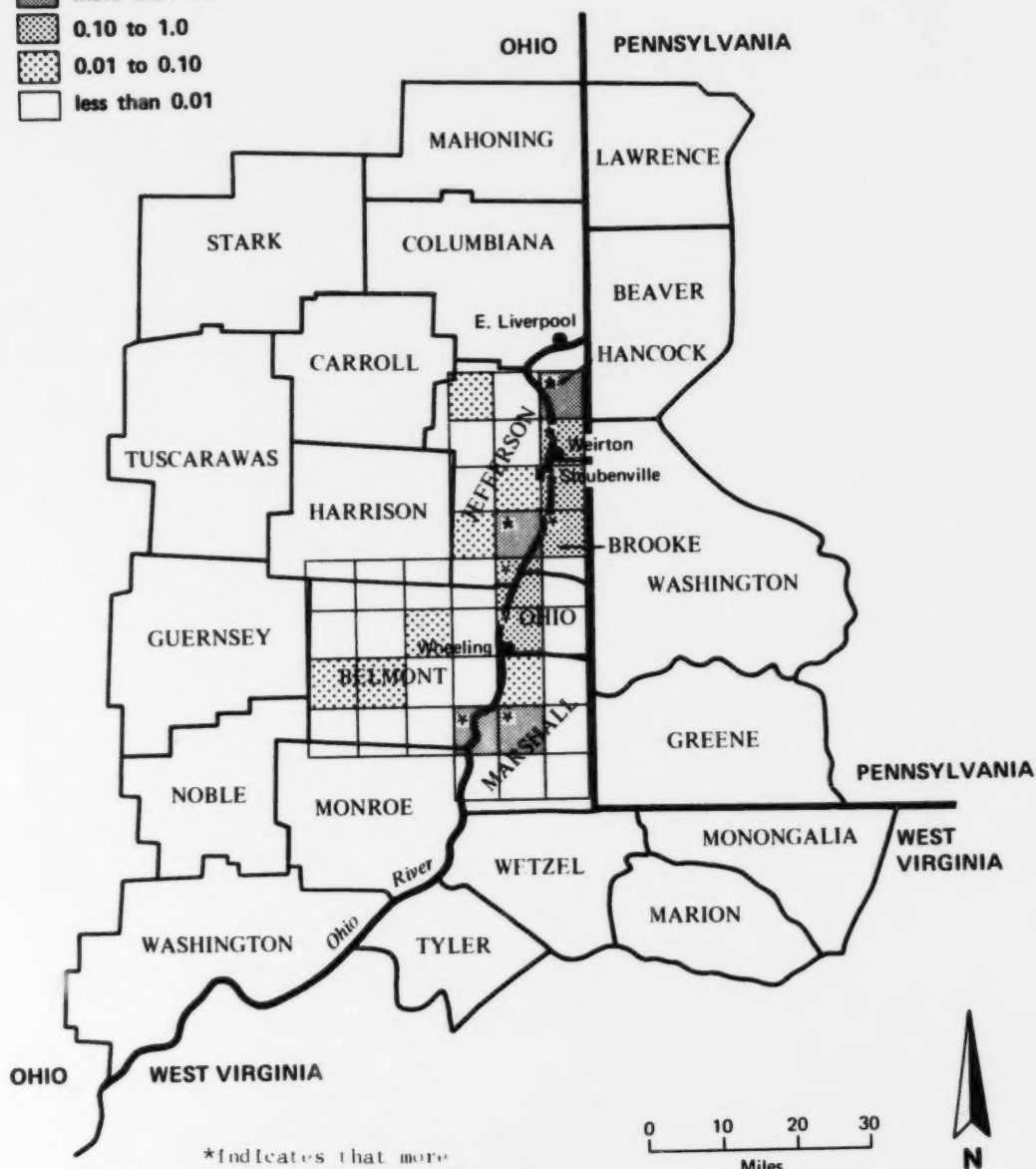
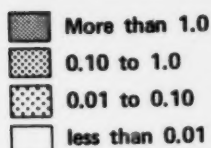
Tons Per Square Kilometer Per Day



*Indicates that more than 50% of the emissions in the grid are due to point sources.

FIGURE 9
SULFUR OXIDE EMISSIONS

Tons Per Square Kilometer Per Day

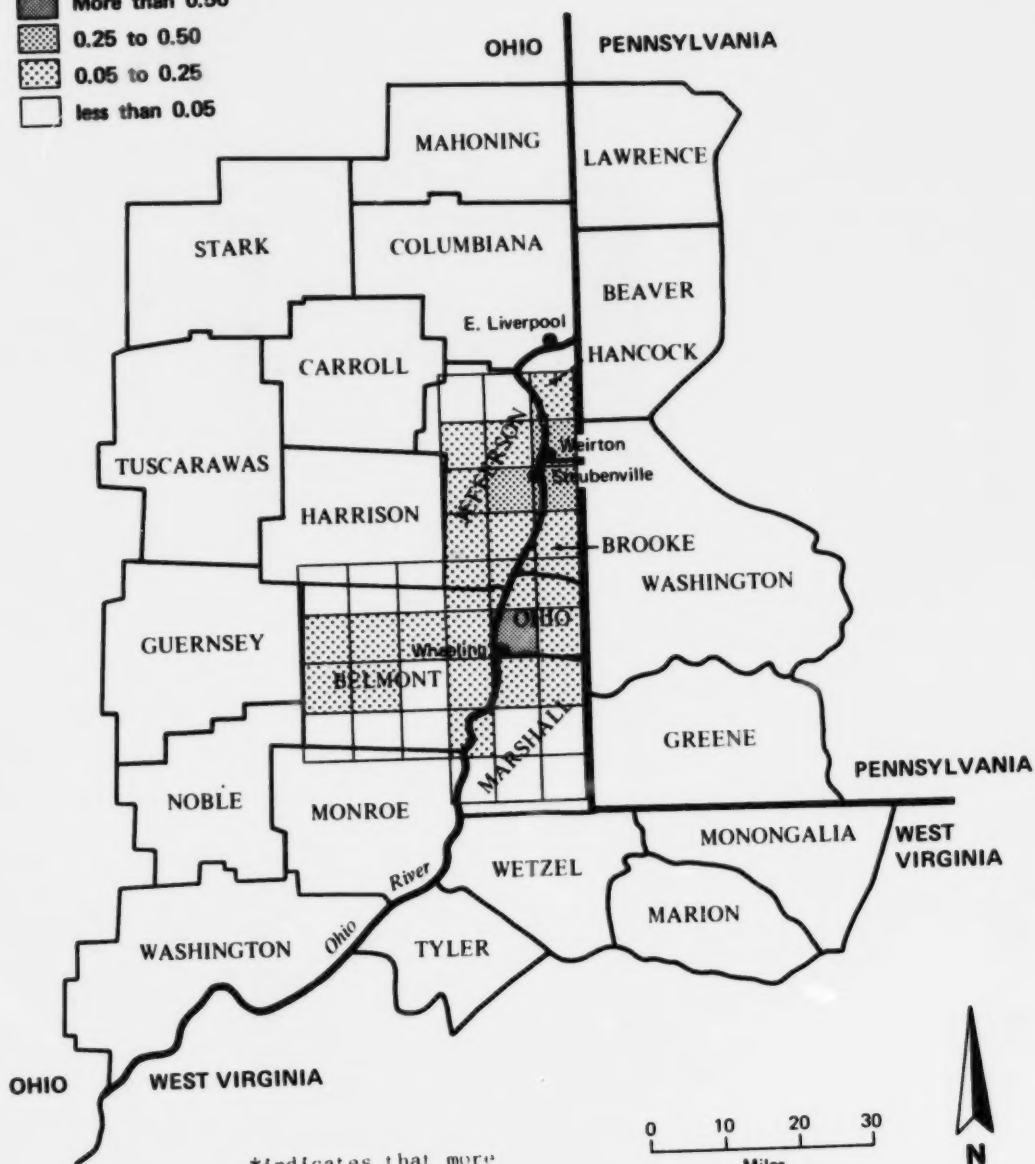


*Indicates that more than 50% of the emissions in the grid are due to point sources.

FIGURE 10
CARBON MONOXIDE EMISSIONS

Tons Per Square Kilometer Per Day

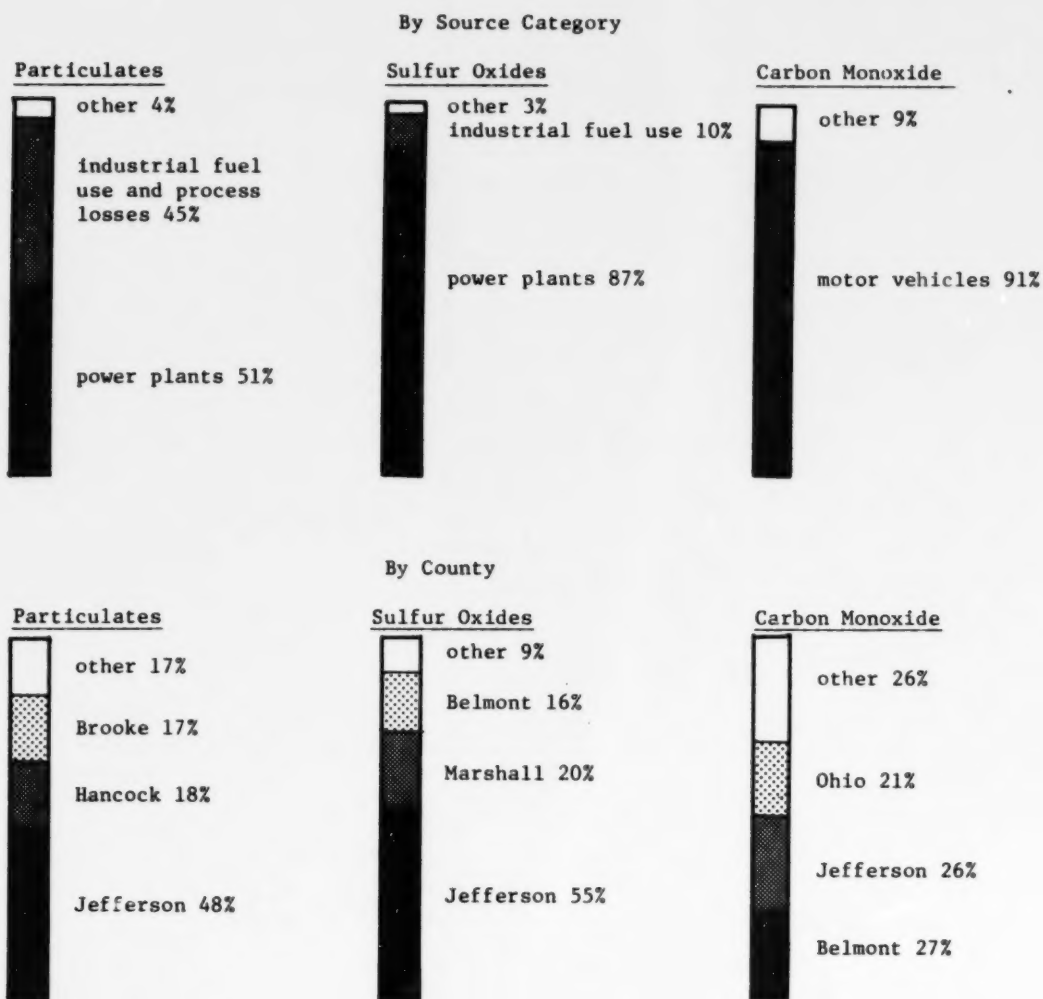
- More than 0.50
- 0.25 to 0.50
- 0.05 to 0.25
- less than 0.05



*Indicates that more than 50% of the emissions in the grid are due to point sources.

Figure 11:

PERCENT CONTRIBUTION TO EMISSIONS BY SOURCE CATEGORY AND COUNTY



Sulfur Oxide Emissions:

Figure 9 demonstrates that the bulk of sulfur oxides emissions occurs along the Ohio River. Power plants are responsible for about 87% of the total sulfur oxides emissions in the study area. About 55% of the total emissions occur in Jefferson County. Since the study area did not include Columbiana, Monroe, or Wetzel Counties, it did not record sulfur oxide emissions from the chemical industries in Monroe and Wetzel and the primary and fabricated metal activities in Columbiana.

Carbon Monoxide:

Figure 10 indicates that carbon monoxide emissions are not as strictly confined to the Ohio River Valley as the emissions of sulfur oxides and particulates. This observation reflects the fact that motor vehicles are responsible for about 91% of the carbon monoxide emissions in the study area. Automotive traffic tends to extend further from the River than the intense industrial activity located almost exclusively within the Valley. Nevertheless, the highest densities of carbon monoxide emissions are still located along the Ohio River in the Cities of Steubenville, Wheeling, and Weirton.

In general, the emission inventory maps indicate the existence of dense pollutant emission rates along the Ohio River. Each of the six Counties included in the emissions study contains part of the core emission area and therefore is associated directly with the regional air pollution problem. Since the emissions inventory did not consider

particulate and sulfur oxides emissions from surrounding counties, including Columbiana, Monroe, and Wetzel, their role in the regional air pollution problem as sources of air pollutants can not be evaluated on a quantitative basis.

TOPOGRAPHY

The emissions inventory identified the location of air pollution sources in the Upper Ohio River area. This section, which deals with topography, and the following section dealing with meteorology, will consider the possibility of transport of pollution from the source locations to neighboring areas.

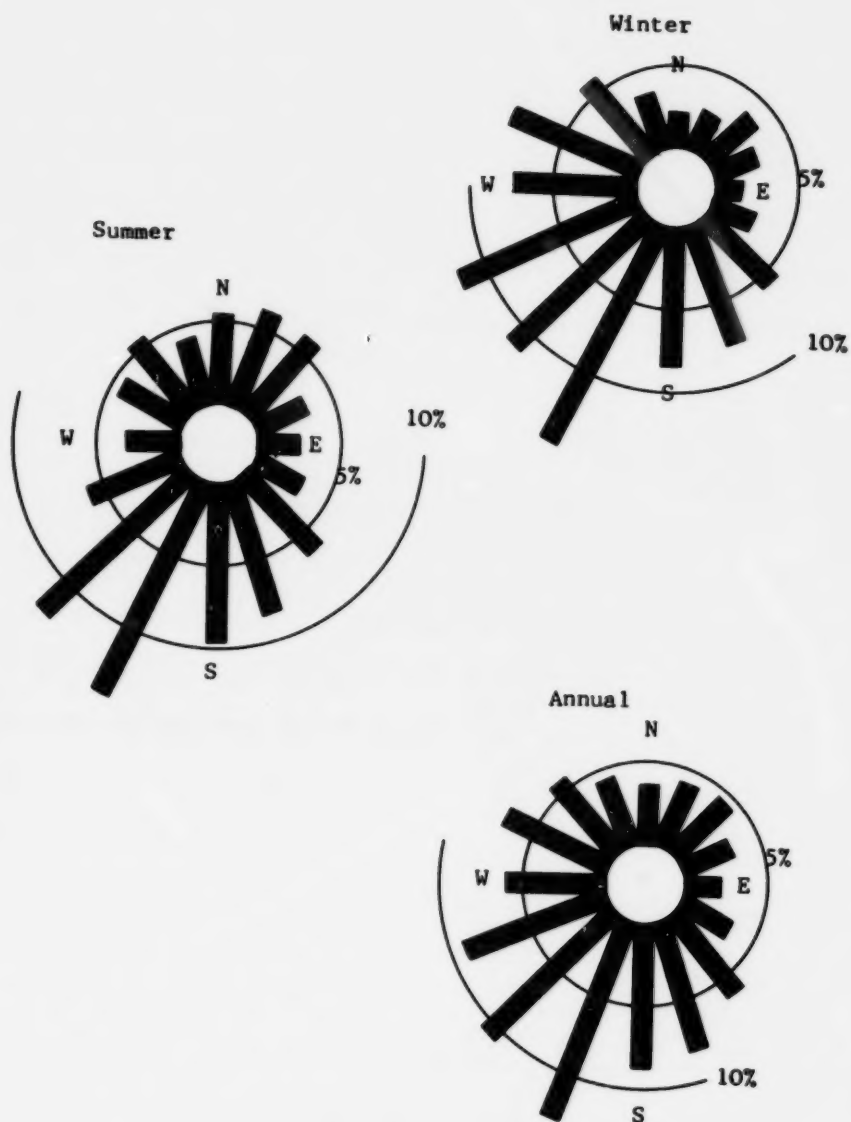
The Upper Ohio River cuts a valley through rugged hilly areas of the western foothills of the Appalachian Mountains. In places, the valley is as much as 700 feet below the highest elevations in the surrounding terrain. The Valley has a strong influence on the flow of air pollutants emitted within it. In general, it inhibits dispersion of pollutants into surrounding areas and forms a natural corridor for the transport of pollutants north and south along the valley.

METEOROLOGY

The climate in the Upper Ohio Valley is warm and humid in the summer but cloudy and cold during the winter. The frequent passage of weather systems creates a changeable climate. Fog occurs in all seasons, especially during the summer and fall. Wind measurements taken at Wheeling Airport reveal that wind from the southwest quadrant is most frequent (see Figure 12). On an annual basis, the wind is from the southwest quadrant about 45% of the time. Furthermore, southwest winds

Figure 12:

WIND FREQUENCIES
Wheeling, West Virginia



tend to have greater speeds than winds from other directions. For example, on an annual basis, winds from the southwest are about 1.5 times as strong as winds from other directions. It would be unjustified to assume that winds throughout the Upper Ohio River area are the same as those measured at the Wheeling Airport. Nevertheless, the general conclusion is probably valid that pollutants are transported along the Ohio River Valley primarily from the southwest to the northeast. Temperature inversions occasionally limit the dispersion of pollutants from the valley, causing a stagnation of air quality within the valley.

AIR QUALITY ANALYSIS

A study of measured and estimated air quality levels is useful in determining the area affected by pollution sources and thus subject to inclusion in the air quality control region. Such a study can be based directly on air quality sampling data in those instances where the sampling program covers a large enough area and has been in existence long enough to provide reliable patterns of air quality throughout the region under study. Measured air quality data can be supplemented by estimated theoretical air quality data derived from a diffusion model using information on the location and quantity of pollutant emissions and on meteorological conditions. The reliability of the diffusion model method is questionable in areas which have an uneven terrain. Since the uneven topography of the Upper Ohio River Valley has a definite impact upon local wind patterns, and since these local variations are not taken into account by the generalized data used by the diffusion model, the model results should be regarded as illustrative rather than definitive.

Measured Air Quality Data

Air quality sampling along the Upper Ohio River has taken place at about 35 separate locations. Most of these locations were within the valley or just a few miles from it. None of the locations was north of New Cumberland or south of the Moundsville area. Therefore, the data presented in Figure 13 and 14 do not extend north to the East Liverpool area or south to the Monroe County area. The figures are based on data taken during the first six months of 1968. Dustfall was measured at about 30 stations, but suspended particulates at only 20. Although lead candle measurements were recorded at a number of stations, they are not reported here due to the lack of specificity in the pollutant measured by the lead candle technique.

Theoretical Air Quality

Figures 15 and 16 present the results of the diffusion model estimates of air quality for particulates and sulfur oxides.

Conclusions

The measured and theoretical air quality data both confirm that which could be expected: pollutant concentrations are highest along the Ohio River Valley and decrease as the distance from the valley increases. Comparison of Figures 14 and 15 shows that the measured suspended particulate concentrations are about twice as large as the theoretical concentrations. Perhaps this variation can be explained by the fact that the diffusion model was unable to take into account the effect of the valley topography, which limits dispersion of pollutants.

FIGURE 13
MEASURED DUSTFALL

Tons per Square Mile per Month:

- More than 60;
- 40 to 60;
- 15 to 40;
- less than 15;



MEASURED SUSPENDED PARTICULATES

Micrograms Per Cubic Meter

■ more than 200;

■ 150 to 200;

□ less than 150;



Figure 15:

THEORETICAL PARTICULATE CONCENTRATIONS

Micrograms Per Cubic Meter, Summer Average



more than 230 (.08 ppm)
170 to 230 (.06-.08 ppm)
115 to 170 (.04-.06 ppm)
55 to 115 (.02-.04 ppm)



The figures show that at least six counties are directly affected by the pollutants emitted along the Ohio River: Jefferson and Belmont in Ohio, and Hancock, Brooke, Ohio, and Marshall in West Virginia. In addition, it appears that the southeast portion of Columbiana County is affected by the transport of pollutants along the valley.

SUMMARY

The emissions inventory showed that power plants and industrial point sources are the major sources of particulate and sulfur oxides pollution along the Upper Ohio River. Motor vehicles are the major source of carbon monoxide emissions. Among the six counties in the emission inventory, Jefferson County contained the largest percent of particulate and sulfur oxide emissions. However, all of the counties in the inventory study area contained significant concentrations of emission sources located along the Ohio River. Thus, the six counties form the core of the regional pollution problem. The Ohio River Valley follows a north-south direction. Since the prevailing wind in the Wheeling Airport area is from the southwest quadrant, it is reasonable to assume that pollutants emitted along the river valley tend to be transported towards East Liverpool, located in the southeast portion of Columbiana County. The analysis of measured and theoretical air quality data supports this assumption. Thus, although Columbiana County probably does not constitute a major source of emissions and probably does not have ambient pollutant concentrations as high as those found in the other six counties, nevertheless, Columbiana appears to be associated with the regional air pollution problem both as a

source and as a receptor. Since the emissions inventory did not cover Monroe and Wetzel Counties, it did not demonstrate that they do not contribute major emissions of pollutant to the Ohio River area. However, on the basis of incomplete information, those two counties appear not to be significantly associated with the regional air pollution problem.

THE PROPOSED REGION

PROPOSAL

Subject to the scheduled consultation, the Secretary, Department of Health, Education, and Welfare, proposes to designate an air quality control region for the Steubenville-Weirton-Wheeling area, consisting of the territory encompassed by the following jurisdictions:

In the State of Ohio;

Belmont County

Jefferson County;

In the State of West Virginia;

Brooke County

Hancock County

Marshall County

Ohio County.

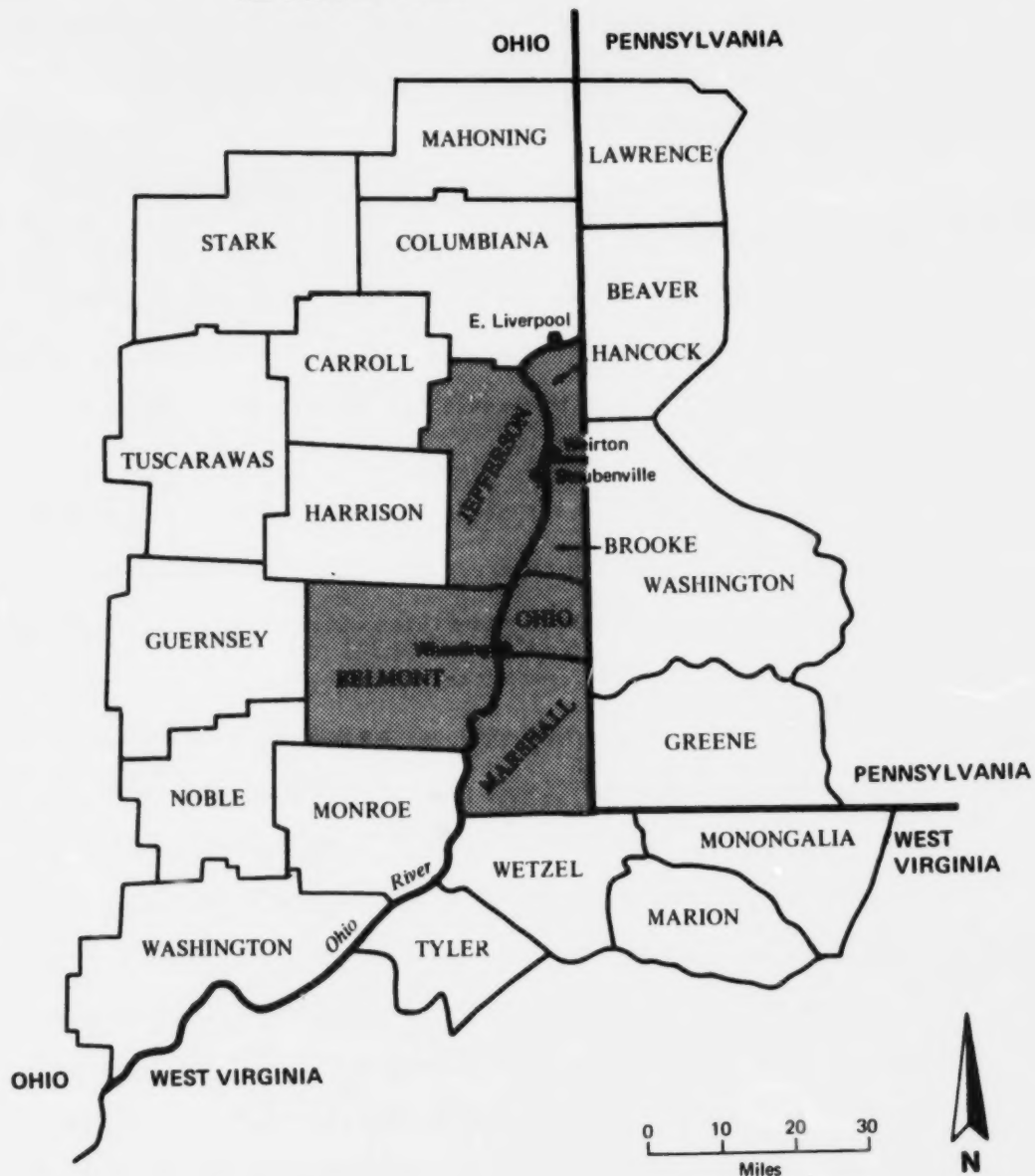
The boundaries of the proposed region are illustrated in Figure 17.

DISCUSSION OF THE PROPOSAL

To be successful, an air quality control region should meet three basic objectives, as discussed in the section entitled "The Size of a Region," page 6. First, a region should be self-contained with respect to air pollution sources and receptors. Second, a region should be designated to meet not only present conditions but also future conditions. Third, region boundaries should foster unified and cooperative governmental administration of the air resource throughout the region.

Figure 17:

THE PROPOSED REGION



The core of the regional air pollution problem is located along the Ohio River Valley from the southern portion of Belmont and Marshall Counties to the northern portion of Jefferson and Hancock Counties. This core area contains the bulk of the population in the area and the majority of the pollutant emission sources. Furthermore, most of the population growth is expected to occur along the core area. Thus, the six counties which contain the core area, Jefferson and Belmont in Ohio, and Hancock, Brooke, Ohio, and Marshall in West Virginia constitute the minimum amount of area which must be included in the Region in order to deal effectively with the regional air pollution problem.

Counties to the west of these six counties do not seem to be significantly associated with the regional air pollution problem except perhaps as suppliers of large quantities of coal which are consumed in the core area. Monroe and Wetzel Counties to the south of the six county area are sparsely populated at the present time and are not expected to register significant population growth during the near future. Although Monroe and Wetzel may contain some point emission sources, the engineering evaluation indicates that they are not significantly associated with the regional problem either as sources or receptors. Therefore, they have not been included in the proposal. East of the six county area lie Washington, Beaver, and Lawrence Counties in Pennsylvania. Since they are part of the Pittsburgh Air Quality Control Region they are not candidates for inclusion in this Region.

Columbiana County to the north of the six county area has present population densities and growth expectations similar to those of Jefferson County. However, it has not joined either of the existing regional planning Commissions in order to coordinate plans for regional growth. Columbiana County contains manufacturing activity in clay and pottery products, primary and fabricated metals, and non-electrical machinery. Although some of this industrial activity is located along the Ohio River in the East Liverpool area, in general the activity is not as intense or concentrated as that which is located along the Ohio River in Jefferson County. In sum, Columbiana County appears to be less closely associated with the regional air pollution problem than any of the six counties in the proposed Region. However, Columbiana is related to the regional problem to a moderate degree both as a receptor and as a source of air pollutants. The inclusion of Columbiana County in the Steubenville-Weirton-Wheeling Air Quality Control Region is not necessary at this time in order to deal with the regional problem. On the other hand, since Columbiana County is associated with the regional problem at least to a moderate degree, it would be a natural partner in any program which might be developed for the management of the regional air resource. Thus, even though Columbiana County has not been included in the proposed boundaries for the Region, the final decision on the inclusion or exclusion of Columbiana County will be made only after careful review of comments submitted to the consultation record by State and local officials. If Columbiana County is not included in the Region at the time of initial designation, it should be the subject of frequent review and should be included in the Region at a later date if changed conditions warrant expanded regional boundaries.

When air quality control region boundaries have been designated, a situation may develop involving a source of pollution on one side of the region boundary which affects in some real way air quality on the other side of the boundary. If adjustment of the boundary is not a practical way to alleviate the situation, relief should be found in the control implementation plan which follows the designation. The plan should contain provisions for the control of sources located close to but beyond the region boundaries. The level of control for such sources should depend, in part, upon the degree to which emissions from the source cause air quality levels to exceed the standards chosen for application within the region.

The boundaries proposed in this report for the Steubenville-Weirton-Wheeling Air Quality Control Region are a starting point for discussion with State and local officials at the scheduled consultation.